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BUREAU OF ENTOMOLOGY  
FOREST INSECT INVESTIGATIONS

PLAN OF OPERATION FOR THE CONTROL  
OF MOUNTAIN PINE BEETLE OUTBREAKS IN WHITE PINE

Forest Insect Field Station  
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MISCELLANEOUS  
FOREST INSECT  
LABORATORY

9

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PLAN OF OPERATION FOR THE CONTROL  
OF MOUNTAIN PINE BARKBEETLE OUTBREAKS IN WHITE PINES

INTRODUCTION

This plan of operation has been prepared in the hopes that it will be of some assistance to the Forest officers who are in charge of the barkbeetle control projects within the white pine stands of the Kootenai and Coeur d'Alene National Forests. The plan of administration, equipment needs, forms, records, etc., which are recommended for these projects are not untried innovations, but have been tried and proven successful in other operations. Some of the forms used for lodgepole pine projects have been revised to meet conditions existing in white pine.

The need for some of these records may be questioned as being superfluous, or too detailed for the requirements of such projects. In explanation as to their need, it can be said that it is only from the keeping of such records that a careful analysis can be made of cost data and a just comparison made between different crews, camps, and projects. In the institution of barkbeetle control work, which is becoming more widespread every year, there are two distinct phases of the problem which are more or less closely related. These two phases are the development of more efficient and economical methods

of control, and the improvement of administrative technique in the handling of control projects which will tend to greatly reduce the cost of institution. To meet the first obligation the Bureau of Entomology is directing practically its entire efforts towards the development of a more economical and efficient method of control. To comply with the second requirement, it is only from the keeping of rather detailed cost and production records that a correct analysis can be made of a project and steps taken to eliminate or improve the weak spots in the administration.

Many of the items discussed, or mentioned, in this report are no doubt irrelevant, as they are but the logical lines which anyone would follow in the organization of such a project. However, with a desire to make the plan as complete as possible, such points have been included with a full realization that many of them are already fully understood by the officers in charge.

The writer desires to express his appreciation to Mr. C. S. Webb, District Logging Engineer, who has very kindly cooperated in the preparation and approval of this plan of administration. Mr. Webb has been in charge of the Big Hole Basin Control Project for the past two seasons and his experience in this connection has made his advice and suggestions on such matters of invaluable assistance. This plan is in reality but a compilation of parts of previous plans which have been tried and found to be satisfactory.

#### SIZE OF ORGANIZATION REQUIRED

The size of the organization which will be required for each of the different areas for which control work is planned is indeed a difficult question to answer, as there are several points to be considered. The work should be completed as early in June as possible, or before the new adult beetles are formed. This gives a relatively short working season of approximately thirty days, and will require the work to be pushed to a degree that will perhaps be beyond the maximum efficiency of the organization. The number of trees to be treated and the intensity of the infestation will have a material bearing upon the size of the organization which will be required in order to complete the work in the time allotted. With a fair amount of walking time between trees, a crew of three men should treat between 6 and 8 trees per day, or an average of 2.5 trees per man-day. With extremely scattered infestations this output will be lowered. The best method to follow in determining the required size of an organization is to start with a rather small number of treating crews, and to crowd the spotting of the area as rapidly as possible. With the data secured from the spotting crews, which will give the number of trees to be treated and their location within the area, the maximum size of the treating organization that will be required can be determined and added to that already existing.

#### NUMBER OF CAMPS REQUIRED

The determination of the number and location of camp sites is a rather difficult problem to decide before an area is spotted. It is best to push the spotting as rapidly as possible in order to determine the actual number of trees to be treated, and their location. From this data one can more efficiently determine the number and the most desirable location of the required camps. A greater efficiency will be secured from larger and fewer camps, because of reduced overhead, cooks, transportation, etc. However the value of this reduction in nonproductive labor must be weighed against the effects of walking the men long distances, or over rough terrain, to their work.

The expense of moving a camp from one site to another must be compensated for by a proportionate increase in production, to make such an action justifiable. However, it is believed that it will prove to be more economical to have one large camp which will need to be moved once during the season than to have two small ones for the entire period.

#### CAMP ORGANIZATION

Each camp should be directly in charge of a camp manager, and if at all possible such men should be Forest officers. The camp manager will be in direct charge of the camp and responsible for the

action of all spotting and treating crews which work from his camp. He will have the supervision of the camp organization and administration and be held responsible for the preparation and submission of all reports, etc.

Though the spotting crews work somewhat independently from the treating organization, it should be understood that they are under the supervision and direction of the camp manager. They will take orders from him, and will be expected to assist the other men in the establishment and moving of camps.

#### CAMP EQUIPMENT

Due to the season of the year that insect control projects are instituted, a better and more comfortable camp is necessary than that which is usually used during the summer season. Comfortable beds, facilities for drying wet clothes, comfortable dining quarters, etc., must be provided if a satisfied and efficient crew is to be maintained.

##### 1. Kitchen

Each camp should be provided with a 14x16 tent for a cookhouse. Another tent 14x16, or 16x16 is necessary for a dining tent, and a 10x12 tent for the cook's and flunkie's sleeping quarters. It is believed that a tent will make a far more comfortable dining shelter than a fly, as during the season of control work considerable inclement weather is encountered. Each kitchen should have an Admiral stove

for cooking, unless something better is available, and a Kimmel firebox for heating water, boiling, etc. Kimmel stoves are not entirely satisfactory on control projects, as due to cold weather they cannot be kept at an even temperature and are useless for baking. The building and banking up of a setting for them so they can be used at all is expensive, and sometimes unsatisfactory. Better cooking can be done with the Admiral and less food wasted.

#### 2. Bunk Tents

A 14x16 tent should be figured for each five men, or a 16x16 tent for six men. The camp manager should have a 10x12 tent as his office quarters, equipped with an extra bed for visiting Forest officers. Either a Sibley stove or Kimmel firebox should be provided for each bunk tent. The Kimmel firebox, having a flat top and using longer wood, is superior to the Sibley. Each stove should be provided with four elbows and seven joints of pipe, so the pipe can be run under the wall of the tent rather than through the roof.

#### 3. Beds

Each bed should consist of 1 tarpaulin, 4 single wool, 1 double wool, and 1 single width cot mattress.

#### 4. General Camp Equipment

The following list of general equipment is based on a 25-man camp. This must be increased or lowered to conform to the actual size of the camp.

#### General Camp Equipment

1 tent, cook, 14x16  
1 tent, dining, 14x16  
1 tent, cook's, 10x12  
1 tent, manager's, 10x12  
4 tents, sleeping, 14x16, or 16x16  
26 mattresses, 3'x6'6", cotton slab  
26 beds, 1 tarp  
    4 single wool  
    1 double wool  
7 stoves, heating, Sibley or Kimmel box  
50 joints, stove pipe  
25 elbows for pipe  
1 grind stone, army  
24 files, 8", flat  
1 hammer, claw  
1 saw, carpenter's  
1 mattock  
1 first-aid kit, F.S. Standard  
5 lbs. hay wire  
10 lbs. 10d nails  
20 lbs. 30d nails  
1 lantern, Coleman's, gas.  
6 doz. candles  
1 saw filing outfit  
1 cobbler's outfit  
2 wash tubs  
2 wash boards  
6 wash basins  
6 water pails, 12 qt.  
10 gallons coal oil  
10 gallons gasoline  
2 wool sacks  
1 mail sack, canvas

#### 5. General Kitchen Equipment

This list of kitchen equipment is based upon a 25-man camp and will need to be adjusted to conform to requirements. Extra dishes, spoons, knives, etc., have been provided so that lunches can be taken into the field and the evening meal served without the inconvenience of having to wait for dirty dishes to be washed.

### Kitchen Equipment

1 25-man K & M outfit, complete  
1 brush, scrub  
1 broom  
1 chopper, food  
1 pancake turner  
2 pots, 5 qt., with covers  
4 pails, 14 qt.  
4 dippers, 1 pt.  
2 pots, coffee, 3 gal.  
6 basins, 4 qt.  
6 basins, 2 qt.  
6 basins, 1 qt.  
24 soup bowls  
24 tin cups  
24 tin plates  
24 knives  
24 forks  
24 teaspoons  
4 pitchers, syrup  
4 pitchers, water  
2 pots, coffee, 4 qt.  
1 canvas meat sack, 4'x5'  
2 lanterns, Coleman, gas.  
1 Admiral cook stove  
5 joints, 6" pipe  
1 Kinsel firebox  
7 joints, 5" pipe  
2 stovepipe collars, asbestos  
1 hammer, claw  
1 axe, D.B., 3 $\frac{1}{2}$ '  
1 table top, canvas roll, 16'  
1 table top, canvas roll, 12'

### 6. Spotting Crew Equipment (6-man crew)

100 Spotter's Daily Reports  
12 Spotter's Weekly Reports  
1 compass, U.S. Standard with staff  
1 tally register  
1 map of forest area,  $\frac{1}{2}$ " scale or larger  
25 maps, map sheets, Form 675  
1 aluminum holder, 8 $\frac{1}{2}$ x11  
4 army canteens, quart size  
5 hand axes, with sheaths

10 lbs. tacks  
3000 cloth tags, 4x6"  
1 doz. pencils and erasers, 4H  
2 blue pencils  
2 red pencils  
2 green pencils  
2 yellow pencils  
Carbon paper  
1/2 1 box lumber crayon, soft black  
1 canvas carrying case

#### 7. Treating Crew Equipment (3-man crew)

1 crosscut saw, 5 $\frac{1}{2}$ '  
2 saw handles  
1 single jack, 4 $\frac{1}{2}$   
2 falling wedges, 2 $\frac{1}{2}$ '  
2 axes, D.B., 3 $\frac{1}{2}$  or 4 $\frac{1}{2}$   
3 peeling spuds  
1 canthook (light)  
1 carborundum stone  
1 water bag  
1 20' diameter tape

Some extra saws and axes should be on hand in case of breakage and to permit of extras while saws are being filed, unless in small camps where sawyers are hired with the understanding they will do their own filing.

#### 8. Camp Manager's Equipment

Time book  
Time slips  
Stationery  
Envelopes  
Camp Manager's Weekly Reports  
Crew Foreman's Weekly Reports  
Pencils  
Horse Contracts  
Man Contracts  
Etc.

## 9. Filing of News

The proper filing of news often becomes somewhat of a problem. It may be possible to secure men in each crew who are capable of taking care of their own news, or it may be more advantageous to have a news filer in each camp. This is a problem which will need to be answered for each camp organization.

## SPOTTING

The importance of "spotting" in its relation to a control project can hardly be overemphasized. "Spotting" is the term applied to the location and marking of beetle-infested trees for treatment. It has been found that men who have keen minds and observing eyes make the best spotters. Men should be selected who are interested in the work under way, and who will realize that the first essential step of a barkbeetle control project is the proper location of the infested trees. If a project is to be charged with the expense of an adequate survey, it is important that the work be thoroughly done, and that the spotters be men of sufficient judgment to properly locate and determine which trees should be marked for treatment. Spotting is hard work, and men are required who are capable of walking rather long distances every day.

It is believed that in all white pine areas which are under consideration at this time a 100 per cent survey will be required.

It may prove feasible to vary this method in certain portions of the areas. A large per cent, if not all, of the trees attacked during the 1928 season will show discolored foliage by May, 1929. In fact with some trees part, if not all, of the needles will have fallen. It is possible that in small patches of white pine one or two men may be able to spot the infested trees by the discolored foliage, providing good views can be obtained of the area. This method "Topographic Survey" will be described later.

All large or solid bodies of white pine should be covered by a 100 per cent survey. The size of crew which will give the best results in such work will depend to a certain extent upon the nature of the terrain being covered. With the usual white pine type a 3-man crew will give the best results, as it will be found that it is nearly impossible for a larger crew to keep in contact with the compassman, who is the "guide" of the party. With an open forest type a larger crew may be used to good advantage. Spotting crews are made up of a compassman and an even number of spotters. The compassman, or chief of party, is held responsible for the compass work, the pacing, construction of a map showing the number and location of infested trees, and the proper marking of trees for treatment. Each spotter is held responsible for the location and marking of all infested trees within a strip, which will vary in width for different regions, on one side of and parallel to the course of the compassman.

The importance of the map which is prepared by the chief spotter cannot be overestimated. When accurately prepared the treating crew foreman will have no difficulty in relocating the marked trees, which will tend to increase the daily output of the crew. Only necessary data should be shown, and the little details which are of no real value but only help to complicate the reading of the map should be omitted. It will be necessary to prepare a copy of these maps for the office files, the camp manager, and one for each treating crew which is working in the area. With the exception of the original, these may be carbon copies, which causes little additional work.

There are various methods of marking infested trees for treatment, which vary from a mere blaze to the use of a paper or cloth tag. The use of a white tag, 4x6 inches, made from sign painter's cloth, has given very good satisfaction in the past, and it is recommended that this tag be used in all future control projects. Each infested tree is marked with one of these tags on which is written, with lumberman's crayon, the crew symbol, the tree number, a place for the D.B.H., the diameter at the top of the length peeled (T.D.), and the length treated (L.T.). Each spotter will carry his own supply of tags which, with the exception of the tree number, will have been previously prepared with the required lettering. In preparing these tags each spotter will place his initials in the lower right-hand

corner. When an infested tree is located the spotter asks the compassman for a number which he places on the tag and fastens it to the tree with a tack in each upper corner. On the side of the tree opposite to the tag the tree should also be blazed and the number placed thereon. This will take but a moment and can easily be done while the compassman is working up his map. This additional marking is necessary due to the fact that a small per cent of the tags are sometimes destroyed by deer and squirrels. Furthermore, it results in a mark on both sides of the tree which facilitates its relocation for treating. By securing the tree numbers from the compassman consecutive numbers are used and confusion avoided.

The width of the strip which each spotter must cover will depend upon the character of the terrain and the timber type which is being covered. As in dense white pine stands the pitch tubes are rather hard to see, it is necessary to look rather closely at every tree, so the strip can only be of such a width as to permit of such examinations, and not retard the progress of the compassman. A two-chain strip will be found to be a ~~maximum~~ width which one man can efficiently cover, and it is believed that better results will be secured from a narrower one.

In the spotting of infested trees by the topographic method the foliage is used entirely as a guide. The trees with discolored foliage are first spotted from opposite hillsides and all advantageous

lookout points, and their approximate location placed upon a map. The trees spotted in this manner are then visited by the spotter, examined, marked for treatment, and their location carefully checked on the map. In regions that are adapted to this method of survey, it is possible for one or two men to adequately cover rather large areas in quite a short time. It may prove to be expedient to adopt this method of spotting for some portions of the areas under consideration.

In addition to the map which he is obliged to prepare, the chief spotter will also keep the "Spotter's Daily Report" and the "Spotter's Weekly Report".

#### DETERMINATION OF TREES TO BE MARKED

In considering the importance for careful spotting, it will be found that there are two distinct phases of the work. These are the location of all infested or attacked trees within an area, and the proper marking of them after they have been located. The location of attacked trees is but a mechanical operation which, if one is alert, can be made nearly 100 per cent effective. The problem of determining if a tree which shows the external signs of a bark-beetle attack should be marked often offers more serious difficulties.

The insect which we are combating is known as the mountain pine beetle (Dendroctonus monticola), which attacks and kills healthy,

nature western white pine, western yellow pine, lodgepole, sugar pine, white-bark pine, and sometimes Engelmann spruce when in close association with infected pine. The adult insects are rather stout, black, cylindrical barkbeetles, varying in length from  $3\frac{1}{2}$  to  $6\frac{1}{2}/25$  of an inch. These beetles bore through the outer bark and construct long perpendicular egg galleries directly beneath the bark, which slightly groove the wood and extend up the tree. At the bottom or start of these galleries, which vary in length from 12 to 30 inches, there is normally a slight crook of an inch or more that starts at the entrance hole. Eggs are deposited along this gallery which soon hatch into small, white grubs or larvae. In feeding, these larvae excavate individual larval mines at right angles to the egg gallery, which vary in length and width, and are exposed on the surface of the inner bark. When mature the larvae construct a small cell at the end of the larval mine in which the transformation to the new adult takes place. During this transformation the insect goes through what is called the pupal stage, and the small cell is termed a pupal cell.

When the transformation is complete the new adults bore away the intervening bark between cells and congregate beneath the bark for sometime before emergence, or they may bore emergence holes directly out from the pupal cells. When emerging after congregating several insects may use the same emergence hole, or quite often advantage is taken of cracks in the bark, woodpecker work, etc. The emergence of

this insect occurs during July and August, and the new attacks are made during this period. The winter is passed by the insect in an immature larval stage.

Insect-attacked trees are located by the presence of small pitch tubes at the mouth of the entrance hole, discolored foliage, woodpecker work, or bering dust at the base of the tree. Pitch tubes are not always present as when the attack is extremely heavy there are very few, if any, to be seen, so one cannot depend upon this rule as an infallible guide. A few large pitch tubes are usually, but not always, an indication of a pitched-out attack. Woodpecker work is a true indication that there were and probably still are insects beneath the bark. However, it does not prove that the insect is the mountain pine beetle.

Faded foliage can be used as a guide to infested trees, but as the degree of fading will vary for different trees, it must always be supplemented by an examination of the tree. There is no infallible rule which can be given for the proper marking of trees from external evidence. It will be necessary to examine nearly every tree by removing a piece of bark. If the tree has been killed by the mountain pine beetle and there are undeveloped insects beneath the bark, it should be marked for treatment. By undeveloped insects is meant the larvae, pupae, and new adults of the developing broods of the mountain pine beetle. The overwintering parent adults will be found in the top of egg galleries. Normally they will be dead, but do not mark trees for

treatment on the strength of these old adults, for even if they are alive they are of very little, if any, importance. The new adults will vary in color, appearing first as pure white to brown and then to dark black prior to emergence. Many trees may perhaps be found which are attacked on one side only. Where insect broods are present the trees should be marked for treatment.

The safest method to follow in separating the work of the mountain pine beetle from associated insects, which may be found attacking weakened trees, tops of infested trees, etc., is the character of the gallery pattern. The work of the mountain pine beetle is very distinctive and can easily be separated from all other barkbeetles. All Dendroctonus egg galleries are packed solid with boring dust, while those of Ips and other species are open and free from boring dust.

#### METHODS OF CONTROL

The mountain pine beetle attacks the stem or main trunk of white pine, sugar pine, yellow pine, white-bark pine, lodgepole pine, and Engelmann spruce when it occurs in association with pine. The development of the insect from the egg to the new adult occurs directly between the bark and wood. When the bark is removed the larvae and immature pupae are exposed and subsequently destroyed. The method of control recommended is to fell and peel the bark from the infested portion of the trunk and stumps.

The height to which the attack extends will vary for different trees. With some the insect will be found up to a six-inch top, while with others it will only be necessary to remove the bark from the lower portion of the bole. It will often be necessary to cut the bole of the tree at some advantageous point to facilitate the rolling of the logs in order to remove the bark from the underside.

The Henrichs peeling spud, which was developed by Mr. Henrichs in 1926, will be found to be the most satisfactory tool for the removal of the bark. This tool is so constructed that it can be used equally as well for tight as well as loose bark, which eliminates the use of the axe for peeling tight bark, which is a slow process.

The size of the actual treating crew will depend upon local situations and the manner in which the officer in charge of the project desires to administrate his crew. It is felt that best results will be obtained in having each crew fell and peel their own trees rather than to have both felling and peeling crews. Furthermore, a larger output per man-day will be secured from small crews than from large ones. As the infestations in white pine often occur as single trees, large crews are often inefficient, as some men are always waiting for the tree to fall or for the peeling to be completed. With a two-man crew there is no lost motion, but there is the problem of transporting the tools on long moves which will make it advantageous to add a third man to the crew.

## FORMS AND RECORDS

The forms which are recommended for use in connection with the securing of cost and production records have all been tried elsewhere and found to be satisfactory. All reports should be kept up to date and submitted promptly. A discussion of the use and preparation of these forms follows.

### Marking Tags

A sample of the tag to be used in marking the trees for treatment is shown on page A. This tag is made from sign painter's cloth and should be approximately 4x6 inches in size. The tags will be prepared by the spotters so as to show the symbol of the spotting crew "A", "C", "E", etc., tree number (198), and a place for the diameter breast high (D.B.H.), length treated (L.T.), and the diameter of the bole at the height to which it is peeled, (top diameter - T.D.). With the exception of the tree numbers these legends are placed upon the tags by the spotters before going into the field. At the time the tree is treated the tag is removed by the crew foreman who places upon it the D.B.H., the length treated, and the diameter at the top of the treated portion. These tags are preserved and used by the crew foreman in working up his daily report.

### Maps

Standard map sheets (S75) are used in the preparation of the spotters' maps. They should be carefully and accurately prepared. It is from these maps that the marked trees are relocated for treatment.

An error may result in a treating crew marking time for several hours, or cause the foreman unnecessary time and labor in relocating the trees marked. Extra care and thoughtfulness may save hours of nonproductive labor. Only one section or part thereof should be shown on each sheet. Only the essential data, which will prove to be of real benefit in helping to relocate the trees, should be placed on the map. Trails, streams, ridges, peaks, fences, cabins, telephone lines, etc., are some of the features that should be shown, while the little details which are of no value should be omitted. Sample map shown on page B.

#### Spotters' Daily Report

This form as shown on page C is used by the chief of spotters for the purpose of keeping a record of the tree numbers used. These numbers, which are kept consecutively by each crew, are placed on the form before going into the field. As a number is given to a spotter it is checked off in the column marked "S", which means spotted. At the close of each day this form is turned in to the camp manager who checks off in the column marked "T" all of the tree numbers which are turned in by the crew foreman as treated. In this way the camp manager can determine if any marked trees have been missed by the treating crews. The following day the chief spotter starts his sheet with the next number following the last one given out on the previous day.

#### Spotters' Weekly Report

This form is prepared by the chief of each spotting crew for the purpose of reporting the results accomplished during the past week, as

well as general information relative to the amount of territory remaining to be covered from the present camp and the amount of time required. Suggestions as to the proper location of control camps so they will be centrally located to the trees marked are required. Though on this form there is one space provided to show the number of men in the crew, this number may vary from day to day. In order to keep an accurate record of spotting output, it is necessary to show in the column marked "Man-Days" the number of effective man-days for each day worked.

Sample of this form shown on page D.

#### Crew Foreman's Daily Report

This form is used by the treating crew foreman in submitting a daily record of the output of his crew. From the tags taken from the trees treated he will place the tree numbers, the D.B.H., the length treated, and the diameter at the top of the treated section on this form. He will also show the camp, area, forest, date, and number of man-days. With the tree tags, this report will be handed in to the camp manager at the close of each day's work.

The camp manager will check this report against the spotters' daily reports to maintain a record of the trees treated and will then carry out and total the board foot volume, and the square feet of bark surface peeled. These figures can be read directly from tables which will be supplied later. Sample form shown on page E.

### Production Record

This record is maintained by the camp manager and is for the purpose of keeping a complete production record of each treating crew in the camp. From the Crew Foreman's Daily Report the number of trees treated, board foot volume, bark surface, and man-days can be taken directly. To secure the rate per man-day, it is necessary to divide the items, such as trees, volume, or bark surface, by the number of man-days. This is not a complicated form, and by keeping it up to date a clear picture can be had of the efficiency of each crew.

At the end of the month or the job, in order to secure an average rate per man-day, it is necessary to divide the total of the different items, such as the total bark surface peeled by the total number of man-days. Form shown on page 7.

### Camp Manager's Weekly Report

This form is used by the camp manager in submitting a weekly report of the activities of his camp. On this form he will show the daily record of the different treating crews. In the space captioned "Trees Treated" he should show, besides the number of trees treated, the number of square feet of bark surface peeled, as this gives a better idea of the output than just the number of trees. This information can be shown in this manner: 12 - 1600. If there are more than six crews working from the one camp, additional sheets showing the crew production can be appended to his report. He will also show in the proper space the number of meals served, number of effective man-days, number of

effective man-days spotting, the total of all other man-days in camp, the total number of paid man-days, and the amount of contributed time; effective labor, with the total effective labor, and a grand total of man-days for the week. Information relative to personnel, equipment, etc. should be shown under remarks. Sample form on page 6.

Forest Service Forms D.1.-39 and D.1-39A

These standard forms should be used for the ordering of all supplies, as it simplifies the task and eliminates many errors. Sample forms on page II.

Truck and Horse Reports

Standard forms which are in use by the respective Forests should be used in keeping a record of transportation charges. It has been found that transportation often proves to be one of the items of cost which is entirely out of proportion with the other expenditures of the project. From an analysis of accurate truck and pack stock records, it will often be found that such excessive charges can be eliminated in the future by more careful ordering of supplies, transportation of men, etc.

Cost Keeping

In order that an analysis can be made of the cost of the various activities which go to make up a control project, it is necessary that a more detailed accounting be maintained than that which is usually practiced for more firmly established forest projects. Such an analysis is believed to be essential in order that improvements in technique of application and administration can be effected. It is desired, however,

that this cost keeping be reconciled to the system which is practiced by the Forest Service. Detailed costs are required for the following:

Spotting	Equipment and Supplies
Treating	Transportation
Overhead	Subsistence
Camps	Other or Miscellaneous
Travel	

Any method of accounting which will show these itemized costs will be satisfactory.

#### Time Reports

The standard time report (Form D.1-40) will be used in keeping the time of all men employed on the project. On this form the different activities on which a man is engaged will be listed under "Projects or Activities" and the time which he spends charged against them. The total time, rate, and amount earned are extended and totaled as shown on the sample form on page I. Commissary and charges for board are deducted from the total amount earned and shown as Net Due.

#### LIST OF FORMS AND BY WHOM SUBMITTED

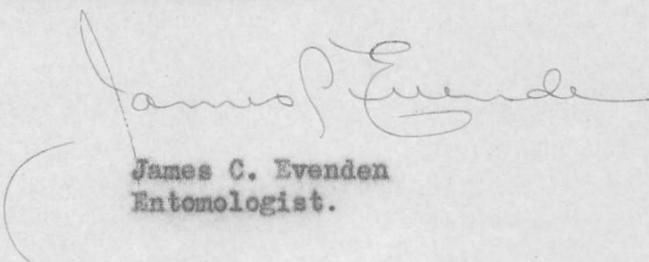
<u>Forms</u>	<u>Submitted</u>	<u>Sample Page</u>
Marking Tags	Chief Spotter	A
Spotter's Maps	Chief of Spotters	B
Spotter's Daily Report	Chief of Spotters	C
Spotter's Weekly Report	Chief of Spotters	D
Crew Foreman's Daily Report	Treating Crew Foreman	
Production Record	Camp Manager	E
Camp Manager's Weekly Report	Camp Manager	F
F.S. Forms D.1-39 and 39A	Camp Manager	G
Truck and Horse Reports	Camp Manager	H
Time Reports	Operator	--
Cost Keeping Form	Camp Manager	I
	Project Clerk	J

### CONCLUSIONS

The first reaction which one may secure from the reading of this plan is that there are a lot of forms, the execution of which will add materially to the cost of the project. This, however, is not the case, for it has been found that the men who are responsible for the submission of these forms prepare them after hours, at no cost to the project, and seem to enjoy this bit of responsibility. The securing of the D.B.H., length treated, and diameter of top of treated section, requires but little extra effort, and is essential in computing the daily output.

The method as given for the keeping of project costs will no doubt entail additional labor on the part of the clerk responsible for the vouchering of the bills, etc. However, it is believed that this additional effort will be more than compensated for in the value of the information secured.

Respectfully Submitted,



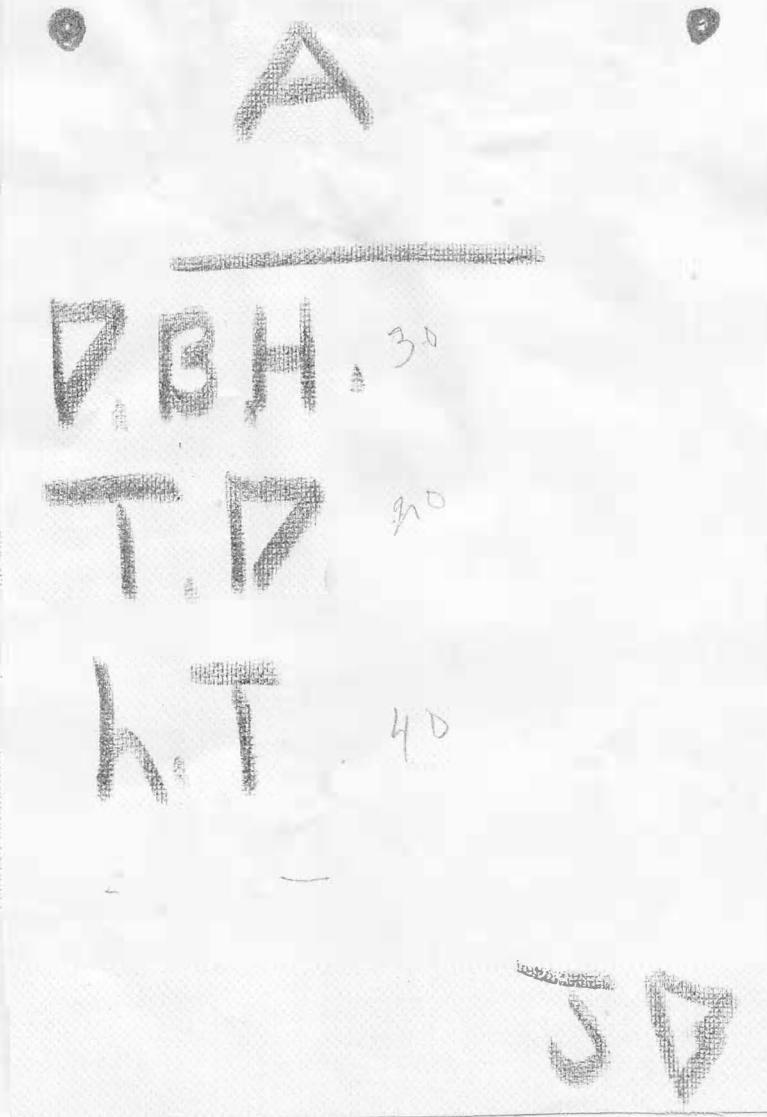
James C. Evenden  
Entomologist.

Approved

s/Elers Koch

Elers Koch  
Assistant District Forester

Marking Tags



- A - Crew Symbol
- - Place for Tree Number
- D.B.H. - Diameter Breast High
- T.D. - Diameter at the Top of Section Peeled
- L.T. - Length Treated
- J.D. - Initials of Spotter

A

Land District. Mag. Declin.

Area

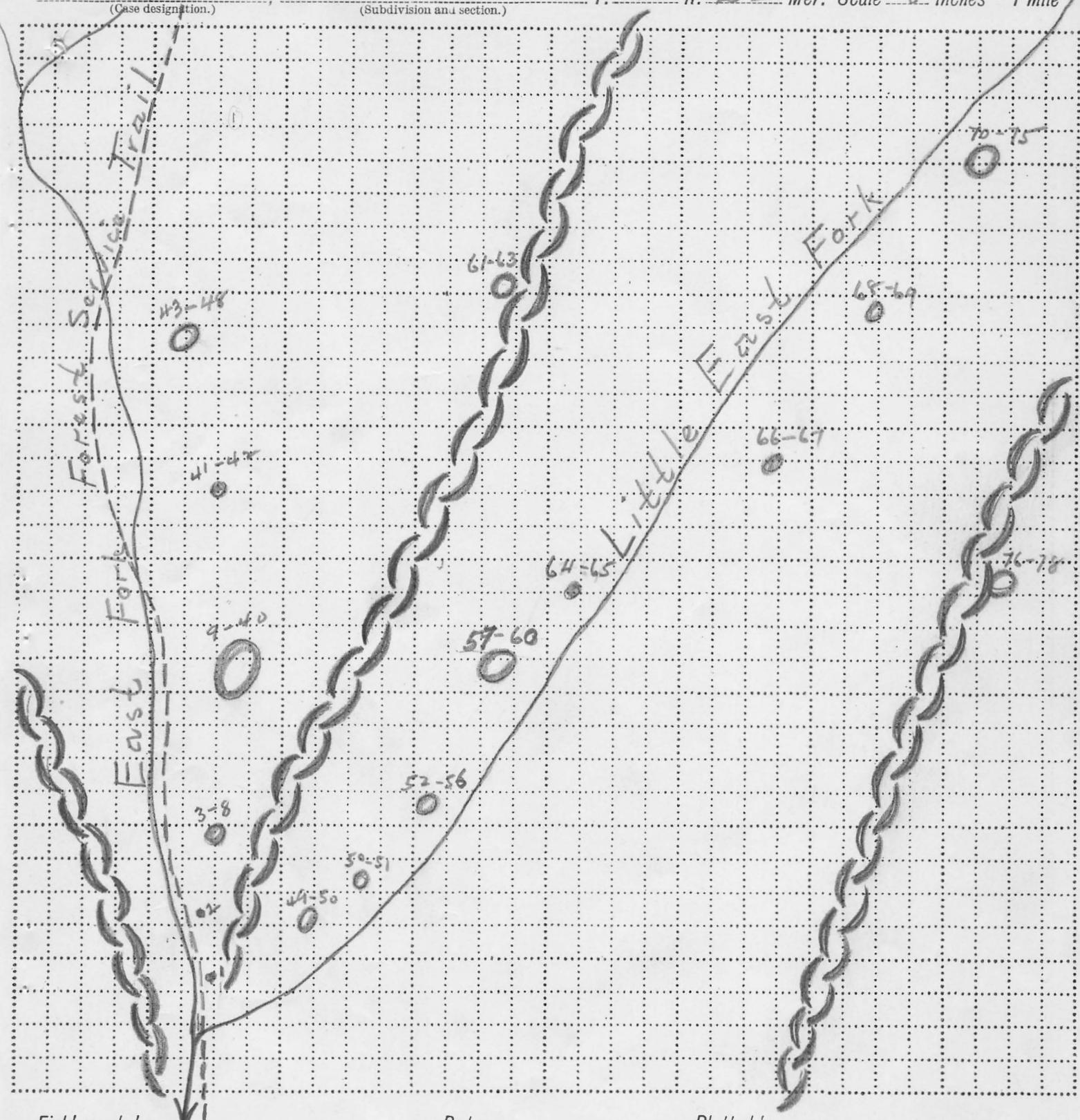
Acres

Sec. 27

T. 51 N R. 2 E Mer. Scale 8 inches = 1 mile

(Case designation.)

(Subdivision and section.)



Field work by

, Date

, Platted by

Remarks: 78 Infested Trees

Approved , 19 ,

(Approving officer.)

I. C. Form "E"

## SPOTTERS DAILY RECORD

Project area                      Unit                              Camp No.

Date	Spotter	T.	R.	Sec.
------	---------	----	----	------

Tree		Tree		Tree		Tree	
S	No.	T	S	No.	T	S	No.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
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99							
100							

## SPOTTER'S WEEKLY REPORT

Week of \_\_\_\_\_ to \_\_\_\_\_

Crew Symbol \_\_\_\_\_

Camp \_\_\_\_\_

Unit or Forest \_\_\_\_\_

Record of Trees Marked for Treatment

Date	Number of Trees Spotted	Section or Area Worked	Man Days	Remarks
S	1	1	1	
S	1	1	1	
M	1	1	1	
M	1	1	1	
T	1	1	1	
T	1	1	1	
W	1	1	1	
W	1	1	1	
T	1	1	1	
T	1	1	1	
F	1	1	1	
S	1	1	1	
S	1	1	1	
<b>Total:</b>				

Remaining territory to be covered from present camp \_\_\_\_\_

Number of days required to complete present (camp) area \_\_\_\_\_

Suggestions as to location of control (camp) in present area \_\_\_\_\_

Suggestions as to new location for spotter's camp \_\_\_\_\_

Remarks. (Suggestions, Requirements, Etc.) \_\_\_\_\_

Signed \_\_\_\_\_

Chief of Spotting Crew

D

## CROW FOREMAN'S DAILY REPORT

CAMP \_\_\_\_\_

AREA \_\_\_\_\_

FOREST \_\_\_\_\_

DATE \_\_\_\_\_

MAN DAYS \_\_\_\_\_

Signature Crow Foreman

Tree :	Length :	Dia. at Top :	Volume :	Square Feet :		
No. :	D.B.H. :	Treated :	of Section :	Board :	Bark Surface :	Remarks
			Treated	Foot	Peeled	
1						
2						
3						
4						
5						
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100						
TOTAL:						

CREW PRODUCTION RECORD

Camp

Area

## Forest

Month of January 19

## Crew

F

## CAMP MANAGER'S WEEKLY REPORT

Forest \_\_\_\_\_ Unit \_\_\_\_\_ Camp \_\_\_\_\_

Production Record for Week of \_\_\_\_\_ to \_\_\_\_\_

Day	Crew		Crew		Crew	
	Trees Treated	Man-Days	Trees Treated	Man-Days	Trees Treated	Man-Days
S						
M						
T						
W						
T						
F						
S						
<b>Totals:</b>						
Day	Crew		Crew		Crew	
	Trees Treated	Man-Days	Trees Treated	Man-Days	Trees Treated	Man-Days
S						
M						
T						
W						
T						
F						
S						
<b>Totals:</b>						

Meals Served	
Day	Number
S	
M	
T	
W	
T	
F	
S	
<b>Total:</b>	

Total effective man-days treating \_\_\_\_\_  
 Total effective man-days spotting \_\_\_\_\_  
 All other man-days in camp \_\_\_\_\_  
 Total man-days paid \_\_\_\_\_  
 Total man-days contributed \_\_\_\_\_

Remarks:

G

Signed \_\_\_\_\_  
Camp Manager

## REQUISITION AND INVOICE

Order No. -----

## FOREST

Ordered by -----  
 Date of order -----  
 To ----- District  
 Destination -----

Charge ..... % FY 192  
 Charge ..... % FY 192  
 Charge ..... % FY 192  
 Charge ..... % FY 192

Item	Unit	Amount ordered	Amount shipped	Item	Unit	Amount ordered	Amount shipped

Filled by ----- Date ----- Packed by ----- Date -----  
 Carried by ----- Date ----- Received by ----- Date -----  
 Shipped on ----- Date ----- Person receiving above listed items shall note on back of form all  
 Waybill or Gbl No: ----- Date ----- shortages and damaged goods.

GOVERNMENT PRINTING OFFICE

8-5341

REQUISITION AND INVOICE

Order No. ....

FOREST

APPROPRIATION

Ordered by.....  
Date of order.....  
To ..... District  
Destination .....

Charge ..... % ..... FY 192  
Charge ..... % ..... FY 192  
Charge ..... % ..... FY 192  
Charge ..... % ..... FY 192

Item	Unit	Amount ordered	Amount shipped	Item	Unit	Amount ordered	Amount shipped
<b>Flour:</b>				<b>Vegetables, canned—Con.</b>			
White, 3/25-lb	Bale			Beans, cut, 24/2	Case		
Graham, 9-lb	Sack			Peas, 24/2	Case		
<b>Leavening:</b>				Pork and beans, 72/6 oz	Case		
Soda	Lb.			Pumpkin, 24/2	Case		
Yeast, 5-ck	Pkg.			Sauerkraut, 24/2	Case		
Baking powder	Lb.			Spinach, 24/2	Case		
<b>Cereals:</b>				Sweet spuds, 24/2	Case		
Rolled oats, 9-lb	Sack			Tomatoes, 24/2	Case		
Farina, 9-lb	Sack			<b>Canned Fruit:</b>			
Cornmeal, 9-lb	Sack			Apples, pie, 24/2	Case		
Cornstarch	Lb.			Peaches, 24/2	Case		
Rice, 3-lb	Sack			Pineapple, 24/2	Case		
<b>Meat and Lard:</b>				Raspberries, 24/2	Case		
Ham, 12-14 lbs.	Lb.			Fig jam, 24/1	Case		
Bacon, 8-10 lbs.	Lb.			Loganberry jam, 24/14	Case		
Roast beef, 24/2	Case			Apricot jam, 24/1	Case		
Roast beef, 24/1	Case			<b>Dried Fruit:</b>			
Salmon, 48/1	Case			Apricots, 5-lb	Cart		
Lard, 4-lb	Pail.			Peaches, 2-lb	Cart		
Lard, 2-lb	Pail			Prunes, 5-lb	Cart		
<b>Dairy Products:</b>				Raisins, 24/15-oz	Case		
Butter, 2-lb	Tin			<b>Relishes, Extracts, Spices:</b>			
Butter, 1-lb	Tin			Catsup, 24/1 bot	Case		
Milk, tall (48)	Case			Pickles, dill, 24/2	Case		
Milk, small (96)	Case			Pickles, dill, 6/10	Case		
Cheese, 1-lb	Box			Pickles, sweet, 24/2	Case		
Eggs, evap., 24/2-dozen	Case			Vinegar, 24/22-oz	Case		
Eggs, case, 30-dozen	Case			Vanilla extract, 4-oz	Bot		
<b>Beverages:</b>				Lemon extract, 4-oz	Bot		
Coffee, 2-lb	Can			Mustard, prepared, 9-oz	Jar		
Coffee, 1-lb	Can			Nutmeg, 4-oz	Can		
Tea, black, 1-lb	Pkg			Ginger, 4-oz	Can		
Tea, green, 1-lb	Pkg			Cinnamon, 4-oz	Can		
Cocoa, 1-lb	Can			Pepper, black, 4-oz	Can		
<b>Sugar and Sirup:</b>				Salt, 3-lb	Sack		
Sugar, 4/25	Bale			<b>Soaps, etc.:</b>			
Sirup, 24/2	Case			Soap, laundry	Bar		
<b>Vegetables:</b>				Soap, toilet	Bar		
Beans, lima, 10-lb	Sack			Cleanser, Dutch	Can		
Beans, navy, 10-lb	Sack			Chloride of lime, 14-oz	Can		
Beans, red, 10-lb	Sack			<b>Miscellaneous Supplies:</b>			
Carrots	Lb.			Matches, 20-cart	Case		
Cabbage	Lb.			Candles (6)	Set		
Onions	Lb.			<b>Special:</b>			
Potatoes	Lb.						
Macaroni, 24/1	Case						
Tapioca, 1-lb	Pkg						
<b>Vegetables, Canned:</b>							
Corn, 24/2	Case						
Carrots, 24/2	Case						

Filled by ..... Date ..... Packed by ..... Date .....  
Cargoed by ..... Date ..... Received by ..... Date .....  
Shipped on ..... Date ..... Person receiving above listed items shall note on back of form all  
Waybill or Gbl. No. ..... Date ..... shortages and damaged goods.

